Building Environmental Awareness: Problem-Based Learning Based on Constructivism

Sholahuddin Al Ayyubi
UIN Sunan Kalijaga
Sholahuddinalayyubi2916@gmail.com
Paed Asih Widi Wisudawati
UIN Sunan Kalijaga
asih.wisudawati@uin-suka.ac.id

Corresponding Author: Sholahuddin Al Ayyubi
Article history: Received: November 23, 2024 | Revised: Februari 12, 2025 | Available Online: April 14, 2025

Abstract

This study explores the potential of integrating Problem-Based Learning (PBL) within a constructivist framework to enhance students' environmental awareness. Employing a descriptive qualitative approach, this research utilizes the Systematic Literature Review (SLR) method to identify, evaluate, and synthesize peer-reviewed literature published between 2020 and 2025. The selection process followed PRISMA guidelines and included academic databases such as Scopus, ScienceDirect, DOAJ, and institutional repositories. A total of 45 articles were initially identified, 20 of which met the inclusion criteria and were analyzed thematically. The findings reveal that integrating PBL and constructivist approaches contributes significantly to the holistic development of students' ecological knowledge, ethical values, and pro-environmental behaviors. The synergy between both pedagogical models fosters authentic, collaborative, and reflective learning environments, encouraging students to engage with real-world environmental challenges. Thematic analysis indicates that PBL enhances cognitive understanding and supports internalizing sustainability-oriented attitudes and actions. This integrative strategy is a promising pedagogical solution to bridge the gap between theoretical knowledge and practical engagement in environmental education. The study offers theoretical contributions by proposing a conceptual framework for ecological learning and practical implications for educators and policymakers in designing curriculum interventions that are contextually relevant and action-oriented. It advocates adopting PBL as a core instructional model to cultivate environmentally responsible and globally competent learners.
Keywords: Environmental Awareness; Problem-Based Learning; Constructivism

Introduction

Environmental awareness is a crucial issue of the 21st century, especially in the climate crisis, pollution, and overexploitation of natural resources. According to World Bank 2021 data, Indonesia experiences an annual economic loss of 3% of GDP due to environmental degradation.[1] One of the leading causes is the low collective awareness of the importance of maintaining ecosystem sustainability from an early age.[2] Formal education is a strategic place to instill the value of environmental awareness, but its implementation is still theoretical and has not touched the applicative aspects in students' real lives.[3]

Experts agree that environmental education should be integrated into the curriculum actively and constructively.[4] Papakostas states that constructivism-based learning models can trigger students' critical reflection on environmental issues and build a more profound understanding.[5] This approach also aligns with the problem-based learning (PBL) proposed by Siti Aisyah, which states that PBL encourages students to relate knowledge to real contexts, including understanding environmental problems.[6] Dayna L. Laur emphasizes that authentic learning experiences are key to constructing meaningful and lasting new knowledge.[7]

Although the urgency of environmental education has been widely discussed, the reality in the field shows that teachers' learning strategies tend to be less varied and lack contextualization of ecological issues. This causes learning to have no significant impact on student behavior and attitude changes. Therefore, it is necessary to comprehensively

[1] World Bank, *The Changing Wealth of Nations 2021: Managing Assets for the Future*, *The Changing Wealth of Nations 2021: Managing Assets for the Future*, 2021, https://doi.org/10.1596/978-1-4648-1590-4.
[2] I M Darwati and I Made Purana, "Problem Based Learning (PBL): A Learning Model to Develop Learners' Critical Thinking. Widya Accarya, 12 (1), 61-69," 2021.
[3] Ria Sandra Nafita, "Implementation Of The Construction Approach With The Problem Based Learning Model In Growing Students' Soft Skill In Islamic Age Education Studies And Budi Pekerti Students Of SMK Negeri 5 Bojonegoro" (Nahdlatul Ulama Sunan Giri University, 2023).
[4] Indra Mayudin and Laili Rahmi, "The Effect of Problem Based Learning Model (Pbl) on Student Learning Outcomes in Science Subjects on Energy Changes in Class IV SD Negeri 76 Pekanbaru," *Didactics: Scientific Journal of PGSD STKIP Subang* 10, no. 3 (2024): 222-34.
[5] Christos Papakostas, "Faith in Frames: Constructing a Digital Game-Based Learning Framework for Religious Education," *Teaching Theology & Religion* 27, no. 4 (2024): 137-54.
[6] Siti Aisyah and Dian Novita, "Teachers' Perception of the Implementation of Project-Based Learning in Early Childhood Education in Indonesia: Project-Based Learning: A Perspective from Indonesian Early Childhood Educators," *Cogent Education* 12, no. 1 (2025): 2458663.
[7] Dayna L Laur, "A Systematic Review of the Literature: The Impact of Constructivist Learning through Authentic Project-Based Learning Experiences" (Sam Houston State University, 2021).

study the effectiveness of combining problem-based learning models and constructivism approaches in building students' environmental awareness.

Several previous studies reveal the relevance of PBL to increased environmental awareness. Saldivar asserted that learning that integrates hands-on experience and critical reflection increases students' understanding of ecological issues.[8] Erawati & Adnyana also showed that the constructivist approach effectively shapes students' conceptual knowledge of sustainability.[9] However, these studies only test cognitive aspects without exploring students' affective and behavioral changes. Kaur & Rai underline the importance of learning designs that emphasize creativity and problem solving,[10] While Luke & Jude highlight the transdisciplinary contribution in strengthening ecological sensitivity.[11] Another study by Lagger suggests that the systemic approach in PBL can internalize sustainability values,[12] But has not been widely applied in the context of learning in Indonesia.

This research offers a new approach by integrating PBL and constructivism in a more applicable and reflective environmental education context. Unlike previous studies that were predominantly descriptive or based on short-term experiments, this research focuses on forming holistic environmental awareness, covering knowledge, attitudes, and actions. This approach is expected to create a more meaningful learning experience and shape students' character as agents of environmental change.

The research will analyze the effectiveness of a problem-based learning model with a constructivist approach in increasing students' environmental awareness. This research is expected to make a theoretical contribution to developing transformative learning models and provide a practical reference for teachers in designing adaptive learning relevant to today's environmental challenges.

[8] John Mark and Navarette Saldivar, "Crafting Minds: A Constructivist Blueprint for Philippine Education Reform" 5, no. 1 (2025): 247–59, https://doi.org/10.47760/cognizance.2025.v05i01.020.
[9] Ni Ketut Erawati and Putu Budi Adnyana, "Implementation Of Jean Peaget's Theory Of Contructivism In Learning: A Literature Review," *Indonesian Journal of Educational Development (IJED)* 5, no. 3 (2024): 394-401.
[10] Ms. Navdeep Kaur and Ms. Monkia Rai, "Design Thinking: As a Digital Tool to Enhance the Creativity and Problem-Solving Ability of Students," n.d.
[11] Gooding Luke and Pullen Jude, "Potluck: Advancing Ecological Citizenship through "Potluck" Teaching: Integrating Transdisciplinary Learning in Mainstream Education," in *BERA Conference* (British Educational Research Association, 2025).
[12] U Lagger, M Forenbacher, and W Mraček, "Construction Of Realities: Bridging Theory And Practice For Design Students," in *INTED2025 Proceedings* (IATED, 2025), 2483-88.

Research Methodology

This research uses a descriptive qualitative approach with the Systematic Literature Review (SLR) method.[13] This approach was chosen to obtain an in-depth, critical, and comprehensive understanding of the relationship between Problem-Based Learning (PBL), the constructivist approach, and students' environmental awareness. The SLR method allows researchers to identify, evaluate, and synthesize relevant scientific evidence systematically and transparently.

Literature was collected following systematic steps as illustrated in the PRISMA diagram. Searches were conducted through various reputable academic databases, such as Google Scholar, ScienceDirect, Scopus, DOAJ, Garuda Ristekbrin, and several repositories of educational institutions and environmental agencies, such as the World Bank and MoEC. The keywords used include a combination of: "Problem-Based Learning", "Constructivism", "Environmental Awareness", "Learners", "Character Education", and "Sustainable Education". The time limit of the literature search was limited to the last five years (2020-2025) to ensure currency and relevance of the sources.

To maintain the validity and credibility of the literature, the researcher used the following criteria: First, Inclusion Criteria: Peer-reviewed and indexed articles, Focus on the topic of PBL integration, constructivism, and students' environmental awareness, Studies at primary to secondary education levels. Published between 2020 and 2025. Indonesian or English language. Second, Exclusion Criteria: Popular articles, personal opinions, or those not passing the academic review process. Literature with incomplete information or without full-text access is not thematically relevant to the focus of the study.

The selection process was conducted in four stages based on the PRISMA model: first, Identification: 45 articles were found through the initial search. Second, Screening: 5 duplicates were removed; 40 articles were screened through title and abstract review. Third, Eligibility: 25 articles were read thoroughly (full-text review). Fourth, Inclusion: The final 20 articles were selected and analyzed as the primary basis for synthesizing the findings.

[13] Syamsul Hadi et al., *Systematic Review: Meta Synthesis for Behavioral Research* (Yogyakarta: Viva Victory Abadi, 2020).

Furthermore, the data was analyzed using a thematic analysis approach, which consisted of: first, initial coding of the main ideas in each article; second, grouping themes such as PBL effectiveness, constructivism approach, environmental awareness formation, and science literacy; and third, thematic synthesis to identify patterns, relationships between concepts, and research gaps.[14] The analysis process was iterative to strengthen the interpretation's validity. The results of this synthesis became the basis for developing a conceptual framework and drawing coherent and in-depth conclusions.

To ensure consistency and accuracy, researchers took several steps: first, *triangulating sources; second, systematically recording each selection stage; and third*, avoiding bias by using objective criteria in selecting and analyzing articles.

Review of Literature Related to the Application of Problem-Based Learning and Environmental Awareness

The PRISMA diagram shown in Figure I presents the systematic selection of the literature used in this review. The process was conducted through four main stages: identification, screening, eligibility, and final inclusion.

1. Identification Stage

   At the initial stage, 45 articles relevant to the research topic were obtained by searching various academic databases, such as Google Scholar, ScienceDirect, and accredited national journals, using the keywords "problem-based learning," "constructivism," and "students' environmental awareness."

2. Screening Stage

   After the duplicate elimination process, 40 unique articles were screened based on title and abstract. At this stage, 15 articles were excluded due to thematic or methodological irrelevance, and 25 were continued for full-text review.

3. Feasibility Stage

   From a thorough review of 25 articles, five were excluded for reasons such as: Did not address the direct linkages between the three main concepts (*PBL, constructivism, and environmental awareness*). Alternatively, the study did not meet

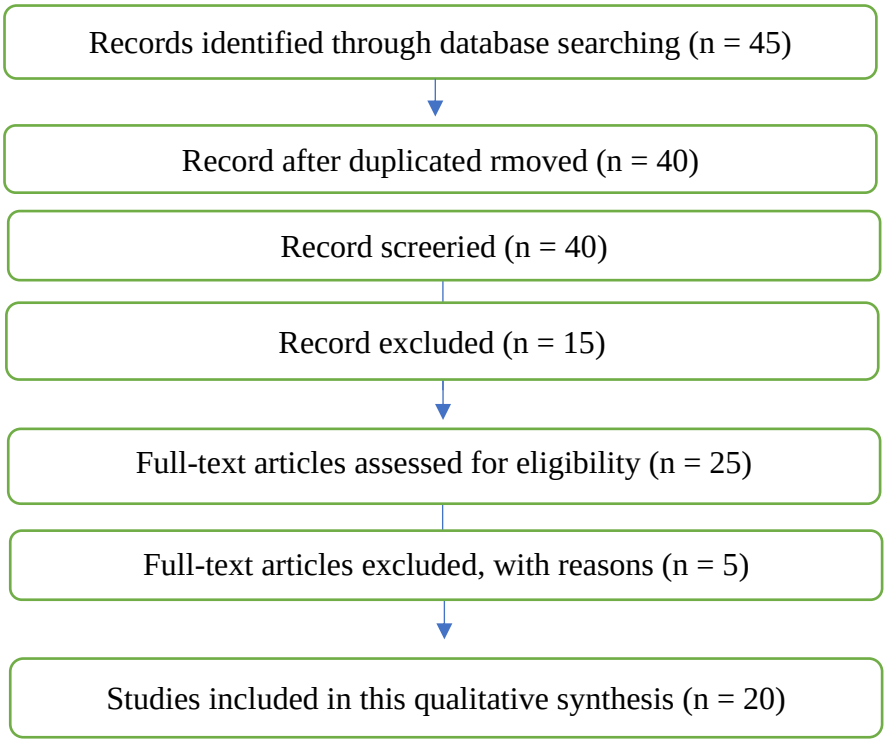
[14] Al Ihksan Agus et al., *Literature Study (Systematic, Narrative, Scoping, Argumentative, Theoritical)*, *Eureka Media Aksara*, 2023.

the methodological inclusion criteria (e.g., overly descriptive report or no evaluation).

4. Inclusion Stage

The final 20 articles were selected and used as the basis for the qualitative literature synthesis. These articles formed the basis for this review's findings, thematic analysis, and conclusions.

Figure I Prism Diagram



Environmental Education and Its Strategic Role

Environmental education plays a vital role in shaping students' ecological awareness, which is in line with broader sustainable development goals.[15] As stated by UNESCO, the goals of environmental education include awareness and knowledge, attitudes, skills, and active participation (UNESCO, 2017).[16] These goals can be effectively realized when environmental education is embedded in the curriculum through active and contextualized pedagogical models.

[15] Wahidah Qomariyah, Mimien Henie Irawati Al Muhdhar, and Endang Suarsini, "Implementation of Problem Based Learning Module with SQ3R Method on Biodiversity Material to Improve Science Literacy and Environmental Care Attitude" (State University of Malang, 2019).
[16] Scientific and Cultural Organization (UNESCO) United Nations Educational, "Education for Sustainable Development Goals: Learning Objectives" (Unesco Paris, France, 2017).

In practice, however, environmental education in many formal schools still focuses on cognitive aspects, with limited engagement on behavioral and participatory dimensions. This gap highlights the importance of integrating pedagogical frameworks that facilitate active learning, reflection, and real-world problem solving, such as the Problem-Based Learning (PBL) model.

Environmental Ethics: From Principles to Pedagogical Practice

Environmental ethics provides a philosophical foundation for environmental education. The ethical principles that all life forms share the earth's limited resources and that humans are part of a larger interconnected web of life, Nadia Devi Nurcahyani, are essential to internalize early on.[17] These principles should be translated into tangible learning experiences in schools, which allow students to question anthropocentric perspectives and recognize their role as stewards of the environment.[18]

For example, when students engage in class projects such as a "clean river campaign" or an energy audit at school, they apply ethical reasoning and cultivate a sense of ecological citizenship. This linkage between moral philosophy and practical action deepens their understanding and commitment.[19]

Problem-Based Learning: Theoretical Foundations and Practical Applications

Problem-based Learning (PBL) is rooted in constructivist theory, which views learning as an active process of constructing meaning through experience and social interaction. The PBL model encourages students to work collaboratively to solve real-world problems through inquiry, analysis, and reflection.[20] In environmental education, PBL provides a dynamic framework for students to explore ecological issues meaningfully and relevantly.[21]

---

[17] Nadia Devi Nurcahyani, "Efforts to Improve Students' Critical Thinking Skills Using the Environmentally Approached Problem Based Learning (Pbl) Model," 2024, 808-14.
[18] Nadia Devi Nurcahyani, "Efforts to Improve Students' Critical Thinking Skills Using the Problem Based Learning (PBL) Model with an Environmental Approach," in *Proceeding of the National Seminar on Science.*, 2024, 808–14.
[19] Suhartinah Suhartinah, Nurlaili Nurlaili, and Usfandi Haryaka, "Principal Management in Improving Clean and Healthy Living Behavior of Elementary School Students at Healthy School Campaign Program Schools," *JIIP-Journal of Scientific Education Sciences* 8, no. 2 (2025): 2285-93.
[20] JIndra Mayudin and Laili Rahmi, "The Effect Of Problem Based Learning Model (Pbl) On Student Learning Results In The Science Study Matter Of Energy Change Class IV SD Negeri 76 PekanbarU," *Didactics: Scientific Journal of PGSD FKIP Independent University* 10, no. September (2024).
[21] Eva Lina, "Implementation Of Problem Based Learning Assisted With Innovative Learning Media To Increase Science Literacy Of Basic School Students," *Holistika Journal* 8, no. 2 (2024): 88-98.

One practical example can be found in a study by Ketut Selamat, where high school students participated in a PBL-based module addressing plastic waste management in their community.[22] The students conducted local research, interviewed stakeholders, and proposed sustainable alternatives to single-use plastics. The results showed a significant increase in environmental knowledge and pro-environmental behavior.[23]

In the Indonesian context, similar PBL strategies have been implemented, such as an eco-literacy project in a junior high school in Yogyakarta, where students were challenged to investigate the causes of flooding in their neighborhood and propose actionable solutions in collaboration with the local government.[24]

Synergy of PBL and Constructivism in Environmental Education

Integrating PBL within a constructivist framework can enhance the effectiveness of environmental education by placing students in authentic learning situations. Erawati and Adnyana highlight that constructivism emphasizes the importance of prior knowledge and experiential learning, which complements PBL's emphasis on engaging real-life problems. They create a holistic learning environment, encouraging more profound understanding and meaningful participation.[25]

This research contributes to the existing literature by showing how combining PBL and constructivism facilitates knowledge acquisition, value internalization, and behaviour change. It reinforces the findings of Anggi Yusriana, who observed that when students engage in inquiry-driven and socially supported learning contexts, they are more likely to develop long-term ecological awareness and responsibility.[26]

---

[22] I Ketut Selamat , "Application of Contextual Learning Based on Problem-Based Learning in Social Studies Learning to Develop Environmental Care Attitudes," *FPIPS Communication Media* 22, no. 2 (2023): 107–14, https://doi.org/10.23887/mkfis.v22i2.56366.

[23] Nurmila Adam et al., "Analysis of Students' Critical Thinking Skills Using the Problem Based Learning (PBL) Learning Model in Integrated Social Studies Class VIII," *Journal of Economic and Business Education* 2, no. 3 (2024): 400-412.

[24] Ida Mawaddah and Sudarsono Sudarsono, "Strengthening Environmental Care Attitudes From an Early Age Through Problem Based Learning Model in IPAS Learning in Elementary Schools," *Journal of PenKoMi: Education and Economic Studies* 8, no. 1 (2025): 181-87.

[25] Agus Mita Rahmi, "The Application of Problem-Based Learning Model to Improve Students' Learning Outcomes in Islamic Religious Education Class X SMK PP Negeri Padang Overcome," *BiCED Proceeding.* 1 (2024): 239–44.

[26] Anggi Yusriana and Helendra Helendra, "Analysis of the Application of Problem Based Learning to Improve Environmental Literacy in Biology Learning for Students," *Classrooms: Journal of Biology Education* 3, no. 1 (2023): 21-26.

The practical implication of this research is that educators should design learning modules that integrate real environmental challenges into the curriculum, using PBL as the core method. Schools should also develop a learning culture that supports exploration, collaboration, and critical reflection, supported by institutional policies that model environmental responsibility.

From a theoretical standpoint, this research enriches the discourse of environmental education by offering an integrated pedagogical framework that links ethical foundations, educational theory, and actionable practices. This research bridges the gap between abstract environmental principles and concrete educational strategies, making it highly beneficial for practitioners, policy makers, and curriculum designers.

Conclusion

Based on a systematic literature review, this study confirms that integrating Problem-Based Learning (PBL) within a constructivist framework has significant potential to holistically improve students' environmental awareness. The PBL model allows students to actively engage in authentic learning situations, encouraging them to develop ecological knowledge, attitudes, and skills through inquiry, critical analysis, and reflection on real environmental issues.

This study shows that PBL strengthens students' cognitive aspects and facilitates internalizing ethical values and more sustainable behavioral changes. The synergy between constructivism and PBL creates a collaborative and transformative learning environment that fosters a sense of long-term ecological responsibility. Implementing this strategy can be a pedagogical solution to address the gap between theory and practice in environmental education in formal schools.

These findings provide theoretical and practical contributions to developing contextual and participatory environmental learning models. Therefore, educators and education policymakers must design curricula and modules that place ecological challenges as the starting point for learning and adopt a systemic PBL approach to shape a generation of environmentally conscious and globally competitive learners.

Bibliography

Adam, Nurmila, Meyko Panigoro, Ardiansyah Ardiansyah, Radia Hafid, and Abdulrahim Maruwae. "Analisis Keterampilan Berpikir Kritis Siswa Dengan Menggunakan Model Pembelajaran Problem Based Learning (PBL) Pada Mata Pelajaran IPS Terpadu Kelas VIII." *Journal of Economic and Business Education* 2, no. 3 (2024): 400–412.

Agus, Al Ihksan, Risma Nurlim, Wa Ode Sri Asnaniar, Rizqy Iftitah Alam, Nur Ilah Padhila, Ernasari Ernasari, and Rahmawati Ramli. *Studi Literatur (Systematic, Narrative, Scoping, Argumentative, Theoritical)*. *Eureka Media Aksara*, 2023.

Aisyah, Siti, and Dian Novita. "Teachers' Perception of the Implementation of Project-Based Learning in Early Childhood Education in Indonesia: Project-Based Learning: A Perspective from Indonesian Early Childhood Educators." *Cogent Education* 12, no. 1 (2025): 2458663.

Darwati, I M, and I Made Purana. "Problem Based Learning (PBL): Suatu Model Pembelajaran Untuk Mengembangkan Cara Berpikir Kritis Peserta Didik. Widya Accarya, 12 (1), 61–69," 2021.

Erawati, Ni Ketut, and Putu Budi Adnyana. "Implementation Of Jean Piaget's Theory Of Constructivism in Learning: A Literature Review." *Indonesian Journal of Educational Development (IJED)* 5, no. 3 (2024): 394–401.

Hadi, Syamsul, Universitas Sarjanawiyata Tamansiswa, Majang Palupi, and Universitas Islam Indonesia. *Systematic Review : Meta Sintesis Untuk Riset Perilaku*. Yogyakarta: Viva Victory Abadi, 2020.

Kaur, Navdeep, and Ms Monkia Rai. "Design Thinking: As a Digital Tool to Enhance the Creativity and Problem-Solving Ability of Students," n.d.

Lagger, U, M Forenbacher, and W Mraček. "Construction Of Realities: Bridging Theory And Practice For Design Students." In *Inted2025 Proceedings*, 2483–88. IATED, 2025.

Laur, Dayna L. "A Systematic Review of the Literature: The Impact of Constructivist Learning through Authentic Project-Based Learning Experiences." Sam Houston State University, 2021.

Lina, Eva. "Implementasi Problem Based Learning Berbantuan Media Pembelajaran Inovatif Untuk Meningkatkan Literasi Sains Siswa Sekolah Dasar." *Jurnal Holistika* 8, no. 2 (2024): 88–98.

Luke, Gooding, and Pullen Jude. "Potluck: Advancing Ecological Citizenship through' Potluck' Teaching: Integrating Transdisciplinary Learning in Mainstream Education." In the *BERA Conference*. British Educational Research Association, 2025.

Mark, John, and Navarette Saldivar. "Crafting Minds : A Constructivist Blueprint for Philippine Education Reform" 5, no. 1 (2025): 247–59. https://doi.org/10.47760/cognizance.2025.v05i01.020.

Mawaddah, Ida, and Sudarsono Sudarsono. "Penguatan Sikap Peduli Lingkungan Sejak Dini Melalui Model Problem Based Learning Pada Pembelajaran IPAS Di Sekolah Dasar." *Jurnal PenKoMi: Kajian Pendidikan Dan Ekonomi* 8, no. 1 (2025): 181–87.

Mayudin, Indra, and Laili Rahmi. "Pengaruh Model Pembelajaran Problem Based Learning (Pbl) Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Ipa Materi Perubahan Energi Kelas IV SD Negeri 76 Pekanbaru." *Didaktik: Jurnal Ilmiah PGSD STKIP Subang* 10, no. 3 (2024): 222–34.

Mayudin, JIndra, and Laili Rahmi. "PENGARUH Model Pembelajaran Problem Based Learning (PBL) Terhadap Hasil Belajar Siswa Pada Mata Pelajaran IPA Materi Perubahan Energi Kelas IV SD Negeri 76 Pekanbaru." *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri* 10, no. September (2024).

Nafita, Ria Sandra. "IMplementasi Pendekatan Konstruktivistik Dengan Model Pembelajaran Problem Based Learning Dalam Menumbuhkan Soft Skill Siswa Pada Mata Pelajaran Pendidikan Agama Islam Dan Budi Pekerti Siswa SMK Negeri 5 Bojonegoro." Universitas Nahdlatul Ulama Sunan Giri, 2023.

Nurcahyani, Nadia Devi. "Upaya Meningkatkan Kemampuan Berpikir Kritis Peserta Didik Menggunakan Model Problem Based Learning (PBL) Berpendekatan Lingkungan." In *Proceeding Seminar Nasional IPA*, 808–14, 2024.

———. "Upaya Meningkatkan Kemampuan Berpikir Kritis Peserta Didik Menggunakan Model Problem Based Learning (Pbl) Berpendekatan Lingkungan," 2024, 808–14.

Papakostas, Christos. "Faith in Frames: Constructing a Digital Game-Based Learning Framework for Religious Education." *Teaching Theology & Religion* 27, no. 4 (2024): 137–54.

Qomariyah, Wahidah, Mimien Henie Irawati Al Muhdhar, and Endang Suarsini. "Implementasi Modul Berbasis Problem Based Learning Dengan Metode SQ3R Materi Keanekaragaman Hayati Untuk Meningkatkan Literasi Sains Dan Sikap Peduli Lingkungan." State University of Malang, 2019.

Rahmi, Agus Mita. "The Application of Problem-Based Learning Model to Improve Students' Learning Outcomes in Islamic Religious Education Class X SMK PP Negeri Padang Overcome." *BiCED Proceeding* 1 (2024): 239–44.

Selamat, I Ketut. "Pengaplikasian Pembelajaran Kontekstual Berbasis Problem-Based Learning Dalam Pembelajaran IPS Untuk Mengembangan Sikap Peduli Lingkungan." *Media Komunikasi FPIPS* 22, no. 2 (2023): 107–14. https://doi.org/10.23887/mkfis.v22i2.56366.

Suhartinah, Suhartinah, Nurlaili Nurlaili, and Usfandi Haryaka. "Manajemen Kepala Sekolah Dalam Peningkatan Perilaku Hidup Bersih Dan Sehat Siswa Sekolah Dasar Pada Sekolah Program Kampanye Sekolah Sehat." *JIIP-Jurnal Ilmiah Ilmu Pendidikan* 8, no. 2 (2025): 2285–93.

United Nations Educational, Scientific and Cultural Organization (UNESCO). "Education for Sustainable Development Goals: Learning Objectives." Unesco Paris, France, 2017.

World Bank. *The Changing Wealth of Nations 2021: Managing Assets for the Future*.

The Changing Wealth of Nations 2021: Managing Assets for the Future, 2021. https://doi.org/10.1596/978-1-4648-1590-4.

Yusriana, Anggi, and Helendra Helendra. "Analisis Penerapan Problem Based Learning Untuk Meningkatkan Literasi Lingkungan Dalam Pembelajaran Biologi Pada Siswa." *Ruang-Ruang Kelas: Jurnal Pendidikan Biologi* 3, no. 1 (2023): 21–26.